

# Attachment 5

IN THE UNITED STATES DISTRICT COURT  
FOR THE MIDDLE DISTRICT OF NORTH CAROLINA

**SHAUNA WILLIAMS, et al.,**

Civil Action No. 23 CV 1057

Plaintiffs,

**REPRESENTATIVE DESTIN HALL, in his official capacity as Chair of the House Standing Committee on Redistricting, et al.,**

Defendants.

**NORTH CAROLINA STATE CONFERENCE OF THE NAACP, et al.,**

Civil Action No. 23 CV 1104

Plaintiffs,

v.,

**PHILIP BERGER, in his official capacity as the President Pro Tempore of the North Carolina Senate, et al.,**

Defendants.

**EXPERT REPORT OF SEAN P. TRENDE, Ph.D.  
Part I: In Response to Dr. Jonathan Rodden**

Exhibit #

Trende 2

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time. I examine those issues in the subsequent section.

### **5.1 The Rodden Report overstates the Court’s rulings in *Cooper v. Harris* and *Alexander v. South Carolina Conference of the NAACP*, regarding the county envelope approach.**

As a threshold matter, the substantive portion of the Rodden Report begins with an overview of the Supreme Court’s treatment of Dr. Stephen Ansolabehere’s “county envelope” approach to detecting racial gerrymandering. It describes the approach as having been “explicitly accepted” by the Court in *Cooper v. Harris*, as having been “reaffirmed” in *Alexander v. South Carolina State Conference of the NAACP*, and as having been the beneficiary of “repeated endorsements” by the Court. The Rodden Report relies in part on footnote 9 of the Court’s *Alexander* opinion. There, it claims, the Court rejected the approach used in South Carolina because “Professor Ansolabehere’s analysis operated at the voter level,” whereas the plaintiffs’ experts in South Carolina were “forced to use precinct-level data.”

I have reviewed pleadings from the *Harris* case related to Dr. Ansolabehere’s work and subsequent decisions, and I was an expert in the *Alexander* litigation. To be clear up front, the proper interpretation of *Alexander* and *Harris* is something for the lawyers to argue about and this panel to decide. I do not offer this as substantive legal argument to the Court.

At the same time, interpreting *Harris* is crucial for structuring the response here. The Rodden Report proceeds under one interpretation of *Harris* and *Alexander*. I have a very different understanding of those cases after having reviewed the record. Because that different understanding affects the way I structure my report, and because I would be reluctant to criticize the county envelope method had it been as fully briefed and cleanly ruled upon as the Rodden Report suggests, I describe my understanding below.

### 5.1.1 The Ansolabehere Report

The Expert Report of Stephen Ansolabehere (“Ansobalbehere Report”) (attached as Exhibit 2) from *Harris* presents its county envelope approach over the course of ten pages. This analysis looks at the race and party registration of registered voters moved into and out of a district within the counties that the district traverses. The Ansolabehere Report claims that “[i]f the lines were drawn without respect to race, one would expect that the White and Black Registered Voters would have approximately the same likelihood of inclusion in a given CD.” *Id.* at 9. There is no citation given for this assertion. The Ansolabehere Report then examines the VTDs that were retained within a given CD both pre- and post-redistricting.

The Ansolabehere Report’s analysis of the map relies on descriptive measures of the districts and does not include any of the regression analyses included in the Rodden Report. *Id.* 10-12. It attempts to disentangle race and politics by examining the percentage of both Black and White registered Democrats, Republicans, and unaffiliated registered voters were placed in Districts 1 and 12 of the congressional map enacted after the 2010 census. It notes that Black Republicans were disproportionately likely to be placed in Districts 1 or 12 than neighboring districts, while the opposite pattern held true for White Republicans or Democrats. The report finally looks to see whether there are differences in the racial or political demographics in residents moved in, out, or kept in the district core. *Id.*

### 5.1.2 The Hofeller Response

In response, the late Dr. Thomas Hofeller filed his Expert Report of Thomas B. Hofeller, Ph.D. (Hofeller Report) (attached as Exhibit 3). Dr. Hofeller was the map-drawer for the post-2010 map and most of his report is dedicated to explaining his reasoning for drawing the districts the way that he drew them. He makes surprisingly few direct attacks on the county envelope methodology, perhaps in part because the state believed District 1 to be a VRA-required district that justified some degree of race-based

line drawing. I identify the following major rebuttal points raised by Dr. Hofeller:

- The envelope analysis only demonstrates that the BVAPs of the districts changed, Hofeller Report ¶27;
- Registration data is inferior to election results, *id.* ¶¶ 33, 55;
- The envelope approach is novel, and we wouldn't expect black and white voters to appear evenly in a random draw *id.* ¶53;
- It would produce bizarre results if a rural district entered into an urban county by one precinct, *id.*;
- It would produce strange results in other states, *id.*;
- It does not take account of considerations such as a desire to repair the Black community in Guilford County, which had been split in the preceding map. *Id.* ¶66.

### **5.1.3 The Ansolabehere Response**

Dr. Ansolabehere filed his “Report of Stephen Ansolabehere in Response to Thomas B. Hofeller” (“Ansolabehere Response”) (attached as Exhibit 4). Much of the report was spent discussing the compactness and other features of the districts. However, he made the following major points with respect to the county envelope approach:

- The 2008 Obama vote upon which Dr. Hofeller relied was problematic, because a single election with a Black candidate could conflate race and politics, Ansolabehere Response ¶¶12-13;
- BVAP doesn't correlate well with the Obama vote, but party registration does, *id.* ¶¶16-19;
- His control for party registration does more than show that the BVAP increased, *id.* ¶23;
- Party registration allows us to circumvent problems of ecological inference, *id.* ¶¶26-30;
- Registration correlates with election results. *Id.* ¶¶3.

### 5.1.4 The trial court ruling

The Motion to Exclude Dr. Ansolabehere's testimony made three points: (1) Dr. Ansolabehere was not properly qualified to testify regarding redistricting; (2) Dr. Ansolabehere examined registration statistics rather than election statistics; (3) the county envelope approach was novel; and (4) Dr. Ansolabehere did not consider the possibility that the map was a political gerrymander and ignored data from adjoining districts. *See Memorandum of Law in Support of Defendants' Motion to Exclude the Testimony and Report of Stephen Ansolabehere* (attached as Exhibit 5).

The trial court opinion spends little time on the county envelope report. Labelling the evidence adduced "circumstantial," the Court simply noted that "in this situation" using registration data instead of vote totals was more appropriate and that defendants had considered registration data during the redistricting process. *Harris v. McCrory*, 159 F. Supp. 3d 600, 621 (M.D.N.C. 2016) (attached as Exhibit 6).<sup>9</sup>

### 5.1.5 Supreme Court ruling

The Supreme Court does not appear to have directly ruled upon the validity of the county envelope approach, either in *Harris* or in *Alexander*. In fact, the Supreme Court was not asked to rule directly on the merits of the county envelope approach in *Harris*. *Harris* went to the Court on an abuse of discretion standard, as the appellees' attorneys made clear. See Brief for Appellees at 31 ("In short, Appellants cannot establish that the Panel's factual findings are clear error—nor distort those factual findings as legal error—merely by expressing their disagreement with the inferences fairly drawn by the Panel from the record evidence.") (attached as Exhibit 7).

In the briefing phase before the Supreme Court, Dr. Ansolabehere's analysis was treated only briefly. The only criticism appellants raised was that Dr. Ansolabehere relied on registration data rather than election data, contrary (in appellants' telling) to the Supreme Court's directive in *Cromartie II*. 532 U.S. at 244 ("[t]he primary evidence

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<sup>9</sup>The dissent spent a bit more time on critiquing Dr. Ansolabehere's methodology. *Harris*, 159. F. Supp. 3d at 640-42 (Osteen, J., concurring in part and dissenting in part).

upon which the District Court relied for its ‘race, not politics,’ conclusion is evidence of voting registration, not voting behavior; and that is precisely the kind of evidence that we said was inadequate the last time this case was before us.”); *id.* at 245 (“As we said before, the problem with this evidence is that it focuses upon party registration, not upon voting behavior. And we previously found the same evidence, inadequate because registration figures do not accurately predict preference at the polls.”) (citations omitted); *Cromartie I*, at 550-51 (expressing preference for election returns over party registration data because in North Carolina “party registration and party preference do not always correspond”). See also Appellants’ Brief at 39-40 (attached as Exhibit 8). Appellees agreed that this was the only criticism placed before the Supreme Court. Brief for Appellees at 29. (“Appellants offer one and only one rejoinder to Dr. Ansolabehere’s testimony – he examined voter registration figures . . . .”) . In short, at best the issue before the Court in Harris was whether or not *Cromartie II* required experts to use election results rather than voter registration figures.

The Supreme Court’s opinion in *Cooper v. Harris* (attached as Exhibit 9) does not weigh the pros and cons of the county envelope approach. Instead, it concludes that the evidence “clear[ed] the bar of clear error review.” The closest the Court came to commenting on the methodology was in a footnote, where the majority observed that registered voting data could be preferable to Dr. Hofeller’s reliance on the 2008 presidential election because the 2008 election involved a Black presidential candidate. *Harris*, slip op. at 27, n.14. Indeed, appellees in that matter emphasized that Dr. Ansolabehere had conducted a specific analysis of registered voters versus election results. Brief for Appellees, at 29-30.

#### **5.1.6 *Alexander v. South Carolina Conf. of the NAACP***

*Alexander v. South Carolina Conf. of the NAACP* is not to the contrary. (attached as Exhibit 10). In that case, plaintiffs lacked the registration data available in North Carolina. Instead, their experts (Dr. Jordan Ragusa and Dr. Baodong Liu) ap-

plied the county envelope approach to precinct-level results.<sup>10</sup> In short, their analysis asked whether a precinct with more Black residents of voting age was more likely or less likely to be excluded from a district after controlling for partisanship.

Far from confining its criticism of this approach to a single footnote, as the Rodden Report seems to suggest, the Court spent six pages dissecting the approach employed by plaintiffs' experts. It noted that Dr. Ragusa's approach was fundamentally flawed because it did not account for contiguity or compactness. *Alexander*, Slip Op. at 23. It noted that many available precincts were "nowhere near District 1's outer boundaries." Slip Op. at 24. Thus, precincts that are not close to the district line "could not have been moved without making District 6 less contiguous or compact." *Id.*

The Court also criticized Dr. Ragusa's method for measuring the partisanship of the district. While the Court did, as the Rodden Report suggests, distinguish the approach used in South Carolina from that in Harris on the basis of registration data versus vote results, its main criticism, which it did not relegate to a footnote, was Dr. Ragusa's failure to use net Biden votes or vote shares rather than Biden votes standing alone. *Id.* at 25.<sup>11</sup>

The Court then turned to Dr. Liu's more traditional county envelope analysis. Here, the Court wrote that "[t]his methodology was highly unrealistic because it treated each voter as an independent unit that South Carolina could include or exclude from District 1. No mapmaker who respects contiguity and compactness could take such an approach. For example, a mapmaker could not assign a black Republican to one district while moving a black Democrat who lives in the same apartment building to another district." *Id.* at 27.<sup>12</sup>

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<sup>10</sup> Logistic regression analysis is another form of regression analysis commonly used for dichotomous outcomes. It tends to produce almost the same results as probit regression.

<sup>11</sup> Note that since the Rodden Report uses individual responses this was not a concern of his.

<sup>12</sup> The Court also criticized Dr. Liu for using the 2018 gubernatorial primary rather than the 2020 general election, the election upon which the legislature purported to rely.

## 5.2 The county envelope approach is not a reliable approach for detecting racial gerrymandering.

With the foregoing in mind, I re-examine the county envelope approach anew. I conclude that it is an unreliable approach that does not shed light on the question of whether race predominated over politics.

### 5.2.1 The county envelope approach lacks a testable null distribution.

The first problem with the county envelope approach is that it lacks an obvious null distribution. As noted above, the null hypothesis is what is actually tested when employing a hypothesis test. It reflects what would happen if our hypothesis were wrong, *i.e.*, the world where race did not predominate in drawing the district lines. In order to test the null hypothesis, we examine the null distribution – that is, the range of things that could reasonably occur if our hypothesis were wrong. Using our coin flipping example, math, as well as some experimental evidence, tells us what a reasonable range of outcomes for a tossing a fairly weighted coin would be.<sup>13</sup> If our results fall outside of the reasonable range of outcomes for tossing a fairly weighted coin, we conclude that the coin wasn't fair.

All hypothesis tests depend on knowing what this null distribution looks like. For a simple regression analysis, we know that coefficients and residual sum of squares are t-distributed, and can therefore draw inferences about whether or not the coefficients are zero. We know coin tosses are binomial and can compare accordingly.

We do not know, however, what a race-free draw would produce in North Carolina. Dr. Ansolabehere attempted to describe what this would look like in *Cooper*, when he

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<sup>13</sup> As a fascinating aside, the initial experimental evidence for the distribution of a coin toss come from John Edmund Kerrich. Kerrich was a South African mathematician who had the misfortune of visiting relatives in Denmark when the Nazis invaded. He was detained and sent to a prison camp which, as one researcher quipped, “freed up his calendar considerably.” <https://community.jmp.com/t5/Learning-Center/Kerrich-Is-a-Coin-Fair-Learn-Inference-for-One-Proportion/ta-p/328054>. While detained, he tested a number of previously theoretical statistical conclusions. Of particular interest here, he tossed a coin 10,000 times and recorded the outcomes. The data are still used to demonstrate the practical results of statistical theory. <https://chris-prener.github.io/testDriveR/reference/kerrich.html>. Kerrich survived and returned to teaching.

wrote “[i]f the lines were drawn without respect to race, one would expect that the White and Black Registered Voters would have approximately the same likelihood of inclusion in a given CD.” Ansolabehere Report at 9. The Rodden Report parrots this language almost exactly. See Rodden Report at 11 (“If the lines were drawn without respect to race, one would expect the likelihood of inclusion to be roughly similar for White and Black voters.”).

This might be true if we were randomly plucking precincts<sup>14</sup> out of a given county without any considerations at all. But this is not how districts are actually drawn. Choosing one precinct limits the immediately available range of precincts to other contiguous precincts. In other words, which precincts go into a district are not entirely random. Instead, the selection of precincts is dependent upon the previous precinct selected for the district.

Even this might not be a problem if racial groups were distributed randomly throughout a county envelope, such that drawing a compact district were no different than randomly selecting precincts. But the Rodden Report demonstrates ably that racial groups are clustered in North Carolina. When groups are clustered, single member districts can naturally distort their distribution. Cf. Jowei Chen & Jonathan Rodden, *Unintentional Gerrymandering: Political Geography and Electoral Bias in Legislatures*, 8 Q.J. Pol. Sci. 239 (2013). At the very least, none of the reports that have ever dealt with the county envelope of which I’m aware have ever laid the foundation for what a race neutral draw in North Carolina would look like.

### **5.2.2 The regression analyses assumes that individuals can be pulled from precincts**

The Rodden Report’s probit model for the Piedmont Triad can be described somewhat non-technically as follows:

Probability(Person x included in District 6, given some data about Person x)

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<sup>14</sup>To simplify verbiage, I will write as if redistricting is being performed at the precinct level. It appears to have been by Mr. Fairfax. Discovery may suggest that North Carolina’s map drawing was, in fact, conducted at the block level. That would not change my methodological conclusions here.

is modeled as:

$$\Phi(\text{the intercept} + \\ \text{whether Person } x \text{ is black multiplied by some coefficient}^{15} + \\ \text{the distance between Person } x \text{ and the population centroid multiplied} \\ \text{by some coefficient} + \\ \text{whether Person } x \text{ resides in Greensboro multiplied by some coefficient} + \\ \text{whether Person } x \text{ resides in High Point multiplied by some coefficient} + \\ \text{some random error term}),$$

where  $\Phi$  is the cumulative density function of the normal distribution.

The problem, though, is that because the model is run at the individual level, it will treat people within the same precinct as if they were independent entities. That is to say, the analysis “treat[s] each voter as an independent unit that [North] Carolina could include or exclude from District [6].” (paraphrasing *Alexander*). This flaw renders the Rodden Report’s regression coefficients functionally useless for ascertaining intent, as they are derived from a model that is based upon a process that was not used in North Carolina and that could not have been used in North Carolina. In other words, the model that underlies the county envelope analysis clearly does not describe what actually occurred here.

In short, the county envelope regression analyses treat North Carolina’s decision to include or exclude an individual from District 6 solely as a function of whether the individual is Black, how far the individual lives from the population center, and whether the person lives in Greensboro or High Point. For Districts 12 and 14 it is even more simplistic, looking only at the individual’s race, distance from the district center, and whether or not they live in Charlotte. In District 1, the model views that choice solely as a function of race and distance. It does not consider the fact that the individual lives

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<sup>15</sup>Again, these coefficients are just another term for the slopes that the regression analysis estimates.

retention, particularly in the areas that form the basis for this litigation. They are particularly low in districts 5, 6 and 14. It is unclear whether it even makes sense to talk about “portions added to” District 6, or what its core might be, since the district is effectively redrawn (indeed, the largest portion of the old District 6 is placed in District 5 in the new map).

## 6 Specific Critiques of the Rodden Report

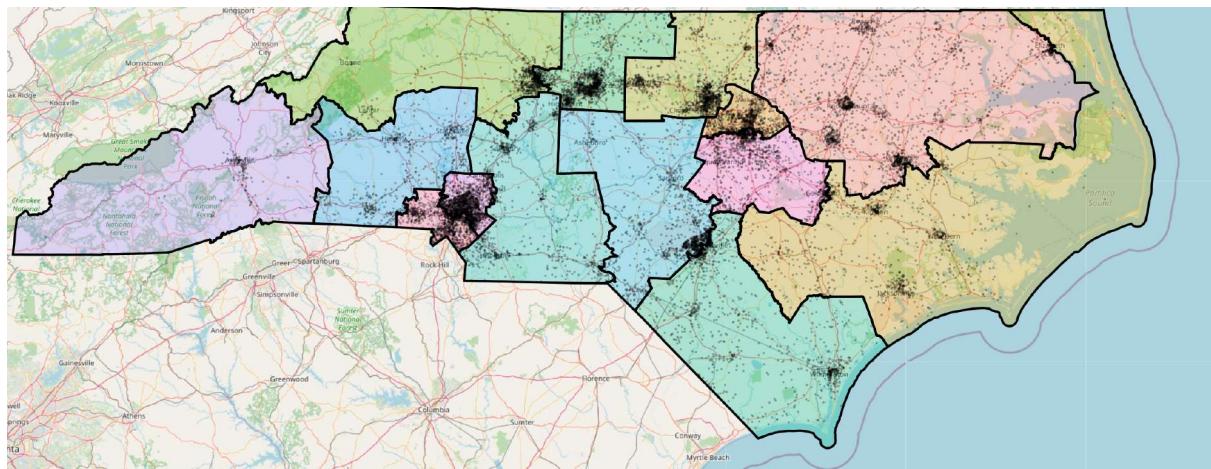
The Rodden Report is mostly dedicated to demonstrating that race predominated in the Enacted Map. As shown above, there are general problems with its methodology. However, even granting the validity of the methods employed, the conclusions reached are still invalid.

### 6.1 The Rodden Report’s general charts and maps are consistent with politics as a dominant consideration.

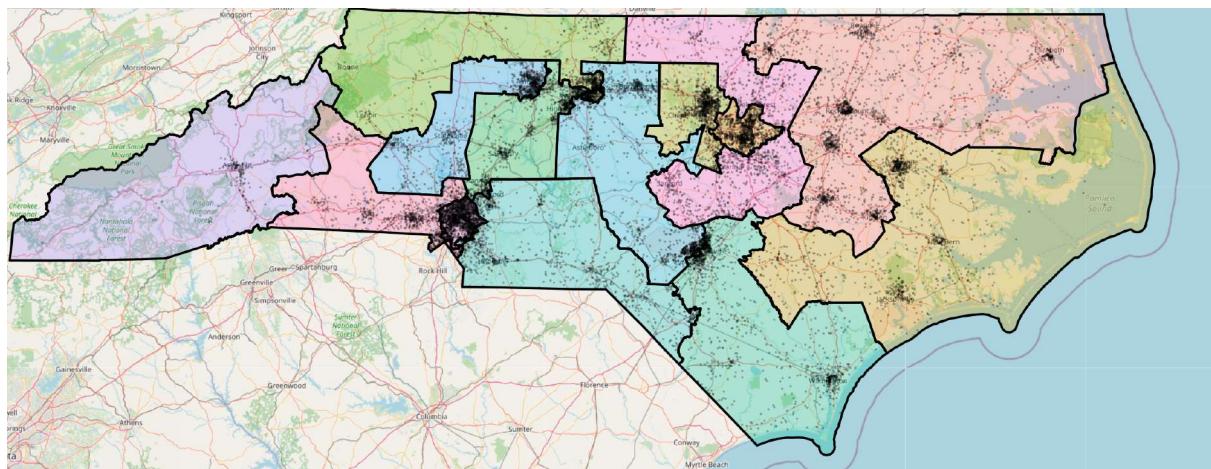
The Rodden Report is largely dedicated to attempting to demonstrate that race was the predominate influence in the drawing of the Enacted Map. The problem is that it does not effectively disentangle race from politics in the Tar Heel State. We begin with the report’s descriptive analysis of race in North Carolina.

The Rodden Report leads with a comparison of maps showing the location of Black residents of voting age in North Carolina. I have recreated the maps using slightly different data below. In the top map, one dot reflects 100 Black registered voters under the 2022 Map, while on the bottom map one dot reflects 100 Black registered voters under the 2023 Map, according to the data used for the Rodden Report.

Figure 12: Dotplots of registered Black voters. 1 dot represents 100 Black registered voters



(a) 2022 Lines



(b) 2024 lines

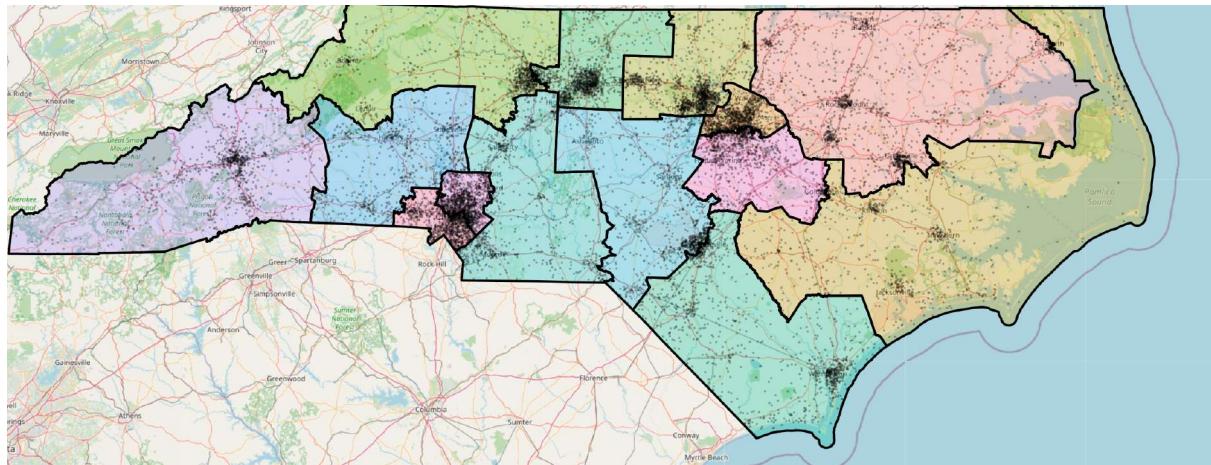
We can consider these maps from a different angle, however. The following map pair again shows the 2022 and 2023 electoral lines. This time, however, one dot reflects 175 registered Democrats.<sup>20</sup> This reveals that the concentrations of Democrats and the concentrations of Black residents of North Carolina, while not completely overlapping, are nevertheless consistent. Thus, whatever the maps of race in the Rodden Report suggest

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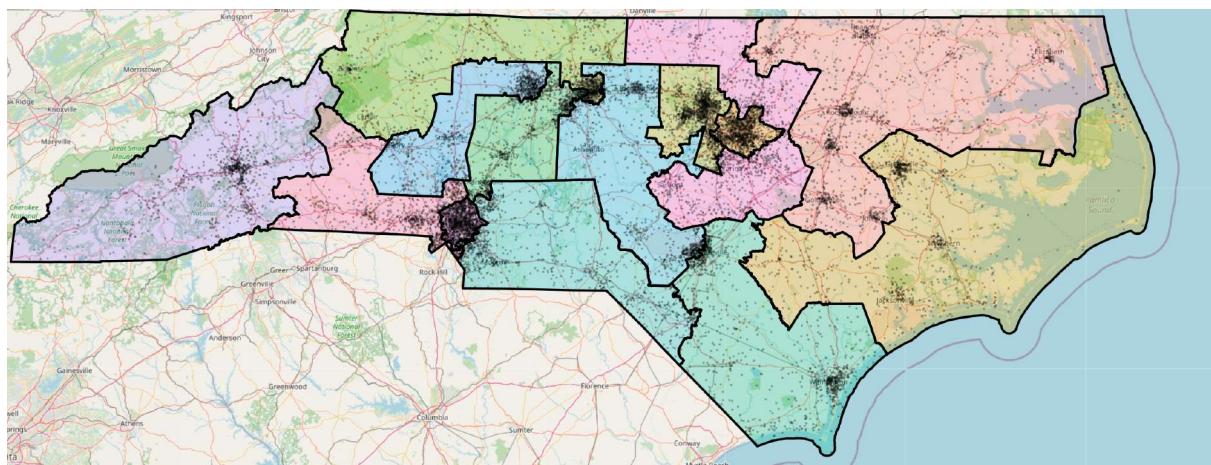
<sup>20</sup>Since there are more registered Democrats than registered Black voters, I use a different scale to decrease overplotting and make maps more directly comparable. Having a dot reflect 175 Democrats will produce roughly the same number of total dots as are produced by having a dot reflect 100 Black registered voters.

is also suggested by the maps of politics. We see the same pattern of packing Democratic voters in Charlotte and Winston-Salem, while cracking them in the Greensboro area, that the Rodden Report ascribes to race.

Figure 13: Dotplots of Registered Democratic voters. 1 dot represents 175 Democratic registered voters



(a) 2022 Lines



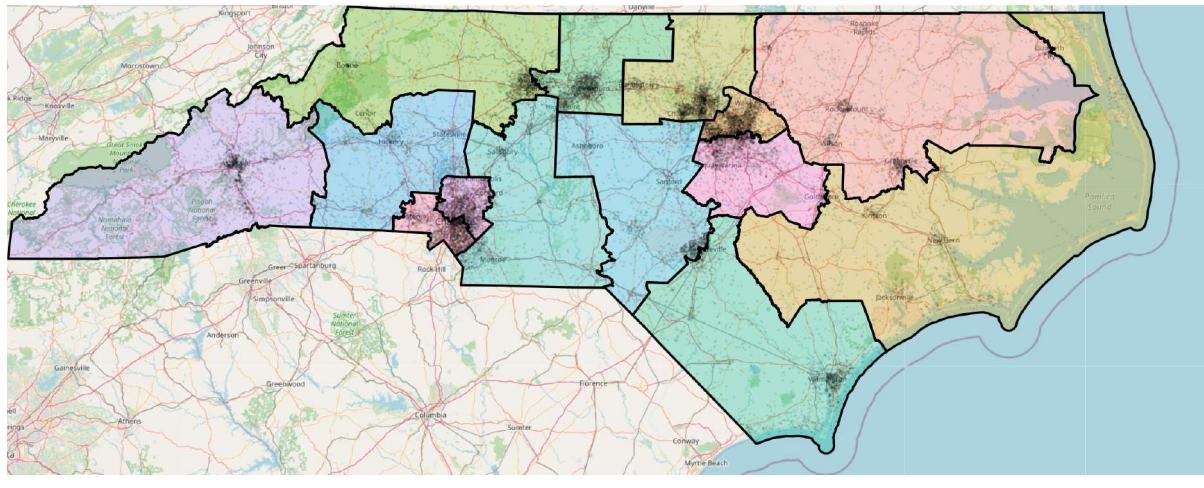
(b) 2024 lines

Looking closer, we can see how the maps functioned. The previous map splits the Democratic “dots” in the Charlotte area in two. The Enacted Map places them together in the same district. In the Piedmont area, the Enacted Map places the Democratic votes in Greensboro, High Point, and a portion of Winston Salem in the same district, while

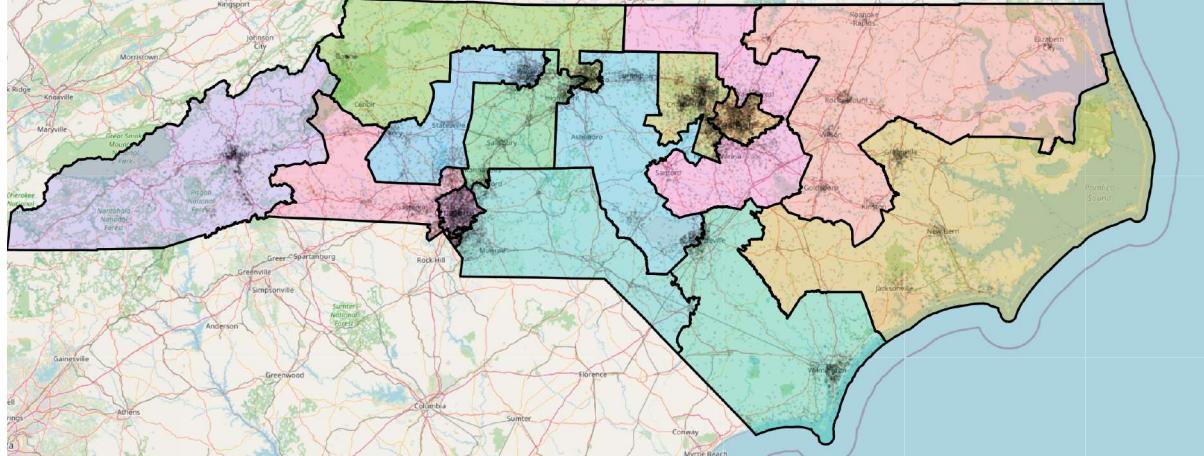
the 2022 Map splits them between three districts. Though not directly at issue in this case, the 2022 Map splits Democratic voters in Raleigh between two districts

We can also examine these districts from the perspective of votes actually cast, rather than from the perspective of registered voters. Each dot here represents 100 votes cast for Democrats in our index. Once again, we can see that these votes follow a pattern similar to those of Black registered voters and registered Democrats. We see the same pattern of packing Democratic votes in Charlotte and Winston-Salem, while cracking them in the Greensboro area, that the Rodden Report ascribes to race.

Figure 14: Dotplots of Democratic votes using the Election Index. 1 dot represents 100 Democratic votes



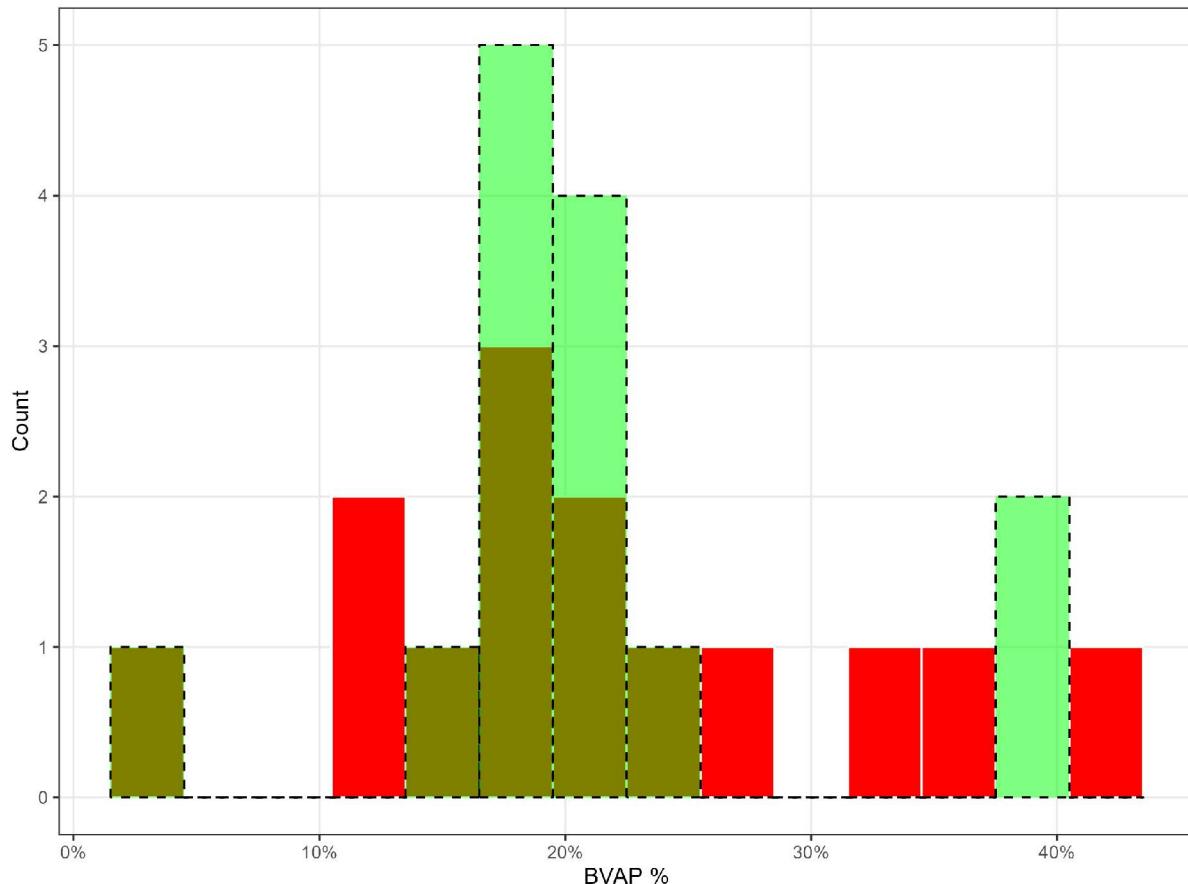
(a) 2022 Lines



(b) 2024 lines

We can also reproduce the Rodden Report's histograms. This reveals an even sharper effect. This shows the distribution of the shares of Black adults included in districts under both the 2022 and 2023 maps. This is similar to the map produced on page 11 of the Rodden Report. Red bars reflect the distributions of BVAP in districts under the 2022 Map, while green bars reflect the same under the 2023 Map.

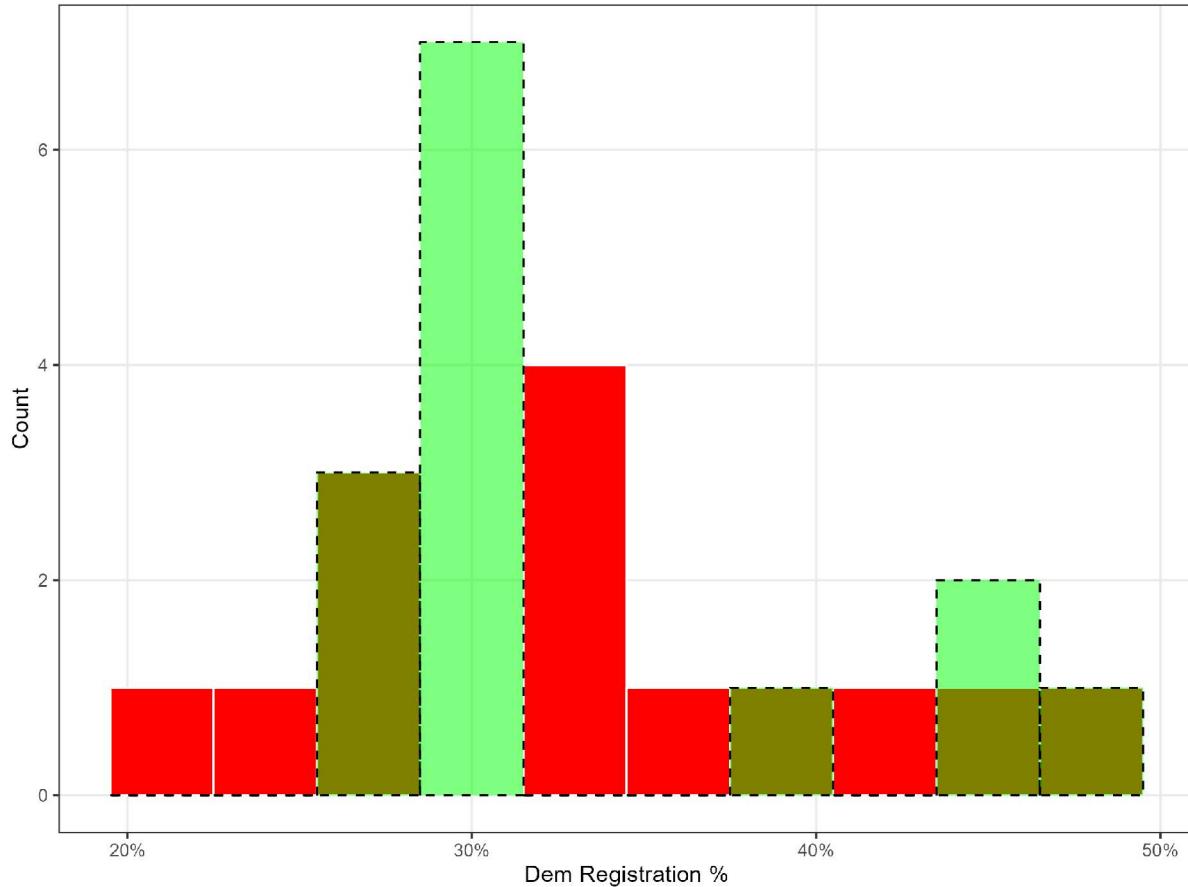
Figure 15: Recreated Histogram from Rodden Report, using BVAP %



- (a) This shows the number of Districts in each bin, with the 2022 map in red and the 2023 map in green with dashed lines. Overlapping areas are dark brown.

When we create similar histograms for the share of registered voters who are Democrats in a district, however, we see the same effect.

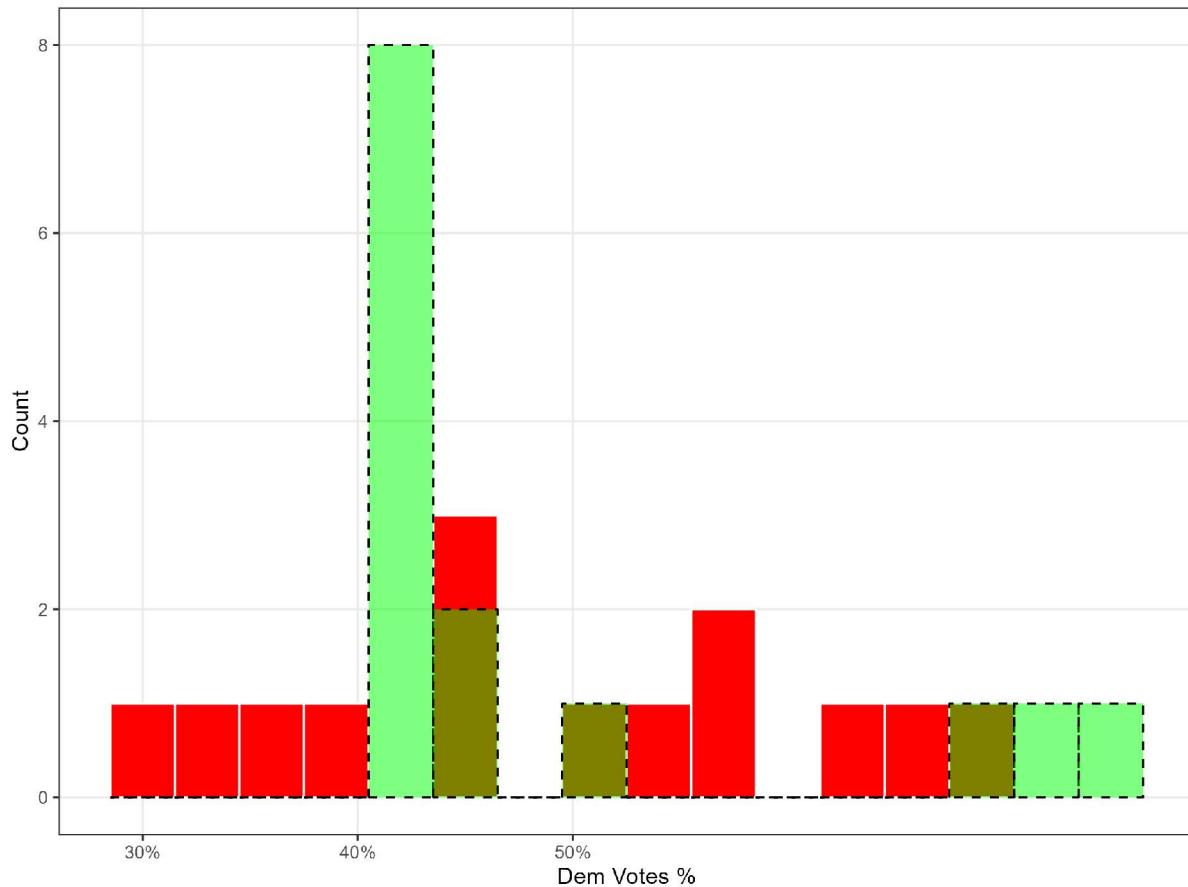
Figure 16: Recreated Histogram from Rodden Report, using Dem. Reg. %



(a) This shows the number of Districts in each bin, with the 2022 map in red and the 2023 map in green with dashed lines. Overlapping areas are dark brown.

If we look at the Election Index data – i.e., actual votes cast – the effect is even more pronounced, with almost all of the districts clustered around 40% Democratic vote share, with a few heavily Democratic districts remaining.

Figure 17: Recreated Histogram from Rodden Report, using Dem. vote share from Election Index



(a) This shows the number of Districts in each bin, with the 2022 map in red and the 2023 map in green with dashed lines. Overlapping areas are dark brown.

Perhaps the best displays, however, are based upon a chart form that Dr. Rodden ran in his code but did not include in his report.<sup>21</sup> The following plot represents the percent BVAP for the 2022 Districts with blue circles and the 2023 Districts with red circles. They are sorted by BVAP % under the 2022 lines. The districts themselves are labelled on the y-axis.

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<sup>21</sup>A version of these plots are created in Dr. Rodden's code titled "districts.stats," at line 38. Dr. Rodden's code only produces the charts for BVAPs; the charts for politics are my own. Dr. Rodden

I declare under penalty of perjury under the laws of the State of Ohio that the foregoing is true and correct to the best of my knowledge and belief. Executed on 26 September, 2024 in Delaware, Ohio.

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Sean P. Trende